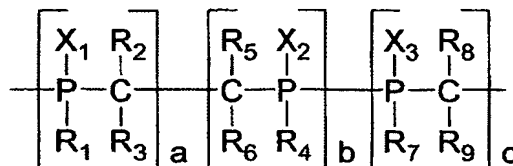


WE CLAIM:

1. A polymer comprising one or more of a unit having the formula:



- 5 wherein:

each of a, b and c is an integer of zero or more and a + b + c equals at least 3;

each of X₁, X₂, and X₃ are the same or different and is an electron pair, a chalcogen, halogen, a Lewis acid, a metal ion, an ylide, an alkoxy, an azide, an alkyl or an alkyl halide;

- 10 each of R₁, R₄, and R₇ are the same or different and is a member selected from the group consisting of: a secondary alkyl; a tertiary alkyl; an alkyl substituted with cycloalkyl, trialkylsilyl, aryl or heteroaryl; an aryl; a heteroaryl; a cycloalkyl; and a heterocycloalkyl, wherein the member comprises at least 3 carbon atoms, heteroatoms if present are selected from -O-, -S-, and -N-, said alkyl, cycloalkyl, heterocycloalkyl, aryl and heteroaryl moieties are optionally substituted with halogen and alkoxy, and said aryl, heteroaryl, cycloalkyl and heterocycloalkyl moieties are optionally substituted with alkyl and alkyl halide; and

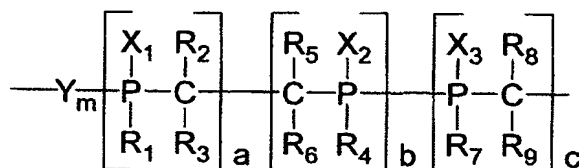
- 20 each of R₂, R₃, R₅, R₆, R₈ and R₉ are the same or different and is a member selected from the group consisting of: hydrogen; a primary, secondary, or tertiary alkyl; an alkyl substituted with cycloalkyl, trialkylsilyl, aryl or heteroaryl; an aryl; a heteroaryl; a cycloalkyl; and a heterocycloalkyl; wherein heteroatoms if present, are selected from -O-, -S-, and -N-, said alkyl, cycloalkyl, heterocycloalkyl, aryl and heteroaryl moieties are optionally substituted with halogen and alkoxy, and said aryl, heteroaryl, cycloalkyl and heterocycloalkyl moieties are optionally substituted with alkyl and alkyl halide.

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2. The polymer of claim 1 having a backbone substantially consisting of alternating C and P atoms.

3. The polymer of claim 1 having a backbone comprising C-C bonds or P-P bonds.

4. The polymer of claim 1 having a backbone comprising P-P and C-P bonds.
5. A polymer comprising one or more of a unit having the formula:



5 wherein:

each of a, b and c is an integer of zero or more and a + b + c equals at least 1;

each of X₁, X₂, and X₃ are the same or different and is an electron pair, a chalcogen, halogen, a Lewis acid, a metal ion, an ylide, an alkoxyl, an azide, an alkyl, or an alkyl halide;

- 10 each of R₁, R₄, and R₇ are the same or different and is a member selected from the group consisting of: a secondary alkyl, a tertiary alkyl; an alkyl substituted with cycloalkyl, trialkylsilyl, aryl or heteroaryl; an aryl; a heteroaryl; a cycloalkyl; and a heterocycloalkyl, wherein the member comprises at least 3 carbon atoms, heteroatoms if present are selected from -O-, -S-, and -N-, said alkyl, cycloalkyl, heterocycloalkyl, aryl and heteroaryl moieties are optionally substituted with halogen or alkoxy, and said aryl, heteroaryl, cycloalkyl and heterocycloalkyl moieties are optionally substituted with alkyl and alkyl halide;

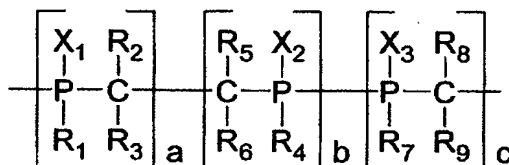
- 15 each of R₂, R₃, R₅, R₆, R₈ and R₉ are the same or different and is a member selected from the group consisting of: hydrogen; a primary, secondary, or tertiary alkyl; an alkyl substituted with cycloalkyl, trialkylsilyl, aryl or heteroaryl; an aryl; a heteroaryl; a cycloalkyl; and a heterocycloalkyl, wherein heteroatoms if present are selected from -O-, -S-, and -N-, said alkyl, cycloalkyl, heterocycloalkyl, aryl and heteroaryl moieties are optionally substituted with halogen or alkoxy, and said aryl, heteroaryl, cycloalkyl and heterocycloalkyl moieties are optionally substituted with alkyl and alkyl halide; and

- 25 Y is a monomer unit of a polyolefin and m is an integer of at least one.

6. The polymer of claim 5 wherein Y is from an acrylate monomer.
7. The polymer of claim 5 wherein Y is from a styrene monomer.

8. The polymer of claim 5 wherein Y is from an alkene monomer.
9. The polymer of any one of claims 5-8, comprising monomer units from different polyolefins.
- 5 10. The polymer of any one of claims 5-10, wherein $a + b + c$ is 3 or more.
11. The polymer of any one of claims 1-10, wherein $a + b + c$ is 4 or more.
- 10 12. The polymer of any one of claims 1-10, wherein $a + b + c$ is 5 or more.
13. The polymer of any one of claims 1-10, wherein $a + b + c$ is 10 or more.
14. The polymer of any one of claims 1-13, wherein $R_2 - R_9$ is hydrogen.
- 15 15. The polymer of any one of claims 1-14, wherein R_3 , R_6 , and R_9 are not hydrogen.
16. The polymer of claim 15, wherein R_3 , R_6 , and R_9 are independently: a tertiary alkyl, phenyl, or heteroaryl, wherein phenyl and heteroaryl are optionally substituted with alkyl, and alkyl, tertiary alkyl, phenyl and heteroaryl are optionally substituted with alkoxy or halogen.
- 20 17. The polymer of claim 16 wherein R_2 , R_5 , and R_8 are independently hydrogen, methyl, ethyl, butyl or a moiety from within the definition of R_3 , R_6 , and R_9 .
- 25 18. The polymer of any one of claims 1-17, wherein R_1 , R_4 , and R_7 are independently a tertiary alkyl, phenyl, or heteroaryl, wherein phenyl and heteroaryl are optionally substituted with alkyl, and alkyl, tertiary alkyl, phenyl, and heteroaryl are optionally substituted with halogen or alkoxy.
- 30 19. The polymer of claim 18 wherein R_1 , R_4 , and R_7 are independently tert-butyl, phenyl, or phenyl substituted with from 1 to 3 C_1 - C_4 alkyl groups.

20. The polymer of any one of claims 1-19, wherein X_1 , X_2 , and X_3 are electron pairs.
21. The polymer of any one of claims 1-19, wherein one or more of X_1 , X_2 , and X_3 are not electron pairs.
22. The polymer of claim 21 wherein one or more of X_1 , X_2 , and X_3 are O, S, a borane or a metal ion.
23. A method of making a polymer comprising one or more units of the formula:



wherein:

- each of a, b and c is an integer of zero or more and $a + b + c$ equals at least 2;
- each of X_1 , X_2 , and X_3 is an electron pair;
- each of R_1 , R_4 , and R_7 are the same or different and is a member selected from the group consisting of: a secondary alkyl; a tertiary alkyl; an alkyl substituted with cycloalkyl, trialkylsilyl, aryl or heteroaryl; an aryl; a heteroaryl; a cycloalkyl; and a heterocycloalkyl, wherein the member comprises at least 3 carbon atoms, heteroatoms if present are selected from -O-, -S-, and -N-, said alkyl, cycloalkyl, heterocycloalkyl, aryl and heteroaryl moieties are optionally substituted with halogen or alkoxy, and said aryl, heteroaryl, cycloalkyl and heterocycloalkyl moieties are optionally substituted with alkyl and alkyl halide; and
- each of R_2 , R_3 , R_5 , R_6 , R_8 and R_9 are the same or different and is a member selected from the group consisting of: hydrogen; a primary, secondary, or tertiary alkyl; an alkyl substituted with cycloalkyl, trialkylsilyl, aryl or heteroaryl; an aryl; a heteroaryl; a cycloalkyl; and a heterocycloalkyl, wherein heteroatoms if present are selected from -O-, -S-, and -N-, said alkyl, cycloalkyl, heterocycloalkyl, aryl and heteroaryl moieties are optionally substituted with halogen or alkoxy, and said aryl, heteroaryl, cycloalkyl and heterocycloalkyl moieties are optionally substituted with alkyl and alkyl halide;

wherein the method comprises reacting a plurality of monomers having the formula:



in the presence of an anionic or radical polymerization initiator, wherein the R₁, R₂, and R₃ groups of the monomer are as defined above and may be the same or different in different monomers.

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24. The method of claim 23 wherein said reacting is carried out at less than 200° C.

25. The method of claim 23 wherein said reacting is carried out at about 150° C or less.

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26. The method of claim 23 wherein said reacting is carried out at about 100° C or less.

27. The method of claim 23 wherein said reacting is carried out at about 30° C or less.

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28. The method of any one of claims 23-27, wherein the monomers used in the reaction are substantially pure.

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29. The method of any one of claims 23-28, wherein the monomers used in the reaction are thermally stable at room temperature. [b1]

30. The method of any one of claims 23-29, wherein the initiator is an alkyl or phenyl lithium compound.

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31. The method of claim 30 wherein the initiator is MeLi or BuLi.

32. The method of any one of claims 23-29, wherein the initiator is an azo compound.

33. The method of any one of claims 1-29, wherein the monomers are co-polymerized with a plurality of one or more polyolefin monomers.
- 5 34. The method of claim 33 wherein the initiator is a radical initiator.
35. The method of claim 34 wherein the initiator is an azo compound.
36. The method of any one of claims 23-35, further comprising isolating a polymer produced by the method.
- 10 37. The method of any one of claims 23-29, further comprising isolating a polymer produced by the method and grafting a polyolefin or one or more monomers of a polyolefin to said isolated polymer.
- 15 38. The method of claim 37 wherein said grafting is initiated by a radical initiator.
39. The method of claim 38 wherein the radical initiator for said grafting is an azo compound.
- 20 40. The method of any one of claims 37-39, further comprising isolating the resulting grafted polymer.
41. The method of any one of claims 23-40, wherein $a + b + c$ in the polymer is 3 or more.
- 25 42. The method of any one of claims 23-40, wherein $a + b + c$ in the polymer is 4 or more.
43. The method of any one of claims 23-40, wherein $a + b + c$ in the polymer is 5 or more.
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44. The method of any one of claims 23-40, wherein $a + b + c$ in the polymer is 10 or more.
45. The method of any one of claims 23-44, comprising the additional step of joining
5 one or more of X_1 , X_2 , and X_3 in the polymer with a chalcogen, a halogen, a Lewis acid, a metal ion, an ylide, an alkoxy, an azide, an alkyl or an alkyl halide.
46. The method of claim 45 wherein X_1 , X_2 , and X_3 are joined with O, S, a borane or a metal ion.